12 March 2024

Ref: 212218/10264

Muswellbrook Coal Company
PO Box 123
Muswellbrook NSW 2333

RE: FEBRUARY 2024 NOISE MONITORING RESULTS – MUSWELLBROOK COAL MINE

This letter report presents the results of noise compliance monitoring, commencing at about 12:00 am on Wednesday 28th of February, 2024, for the Muswellbrook Coal Company (MCC) mine at Muscle Creek Road, Muswellbrook. The monitoring was undertaken as per the requirements of D.A. 205/2002 and detailed in the Noise Management Plan (NMP) for the mine.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the NMP as summarised below.

All attended monitoring and equipment maintenance and calibration is conducted in accordance with the Noise Policy for Industry (NPfI) and AS1055 – Acoustics, Description and Measurement of Environmental Noise.

Attended noise monitoring is undertaken monthly by an independent noise consultant. Each attended noise survey will be conducted during night periods only. If it is identified during the noise monitoring that the mining noise from the operation is exceeding the criteria, MCC will be notified and the operations will be modified as required. Monitoring at the location(s) where the noise levels are elevated will be undertaken again with a minimum break of 75 minutes between monitoring.

The noise criteria for MCC apply under all meteorological conditions except for the following:

i. Wind speeds greater than 3m/s at 10m above ground level; or

ii. Stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10m above ground level; or

iii. Stability category G temperature inversion conditions.

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NPI must be applied, as appropriate, to the measured noise levels.

Due to the distance of the mine from each residence, the monitoring of LA1 (1minute) at the facade is not considered necessary and will be conducted at/or near the property boundary.

The attended noise monitoring locations are detailed in **Table 1** and shown in **Figure 1**.

Table 1
Noise Monitoring Locations

Location	Description
R13	Sandy Creek Road
R15	Queen St
R17	Queen St
R25	Sandy Creek Road
R32	Muscle Creek Road

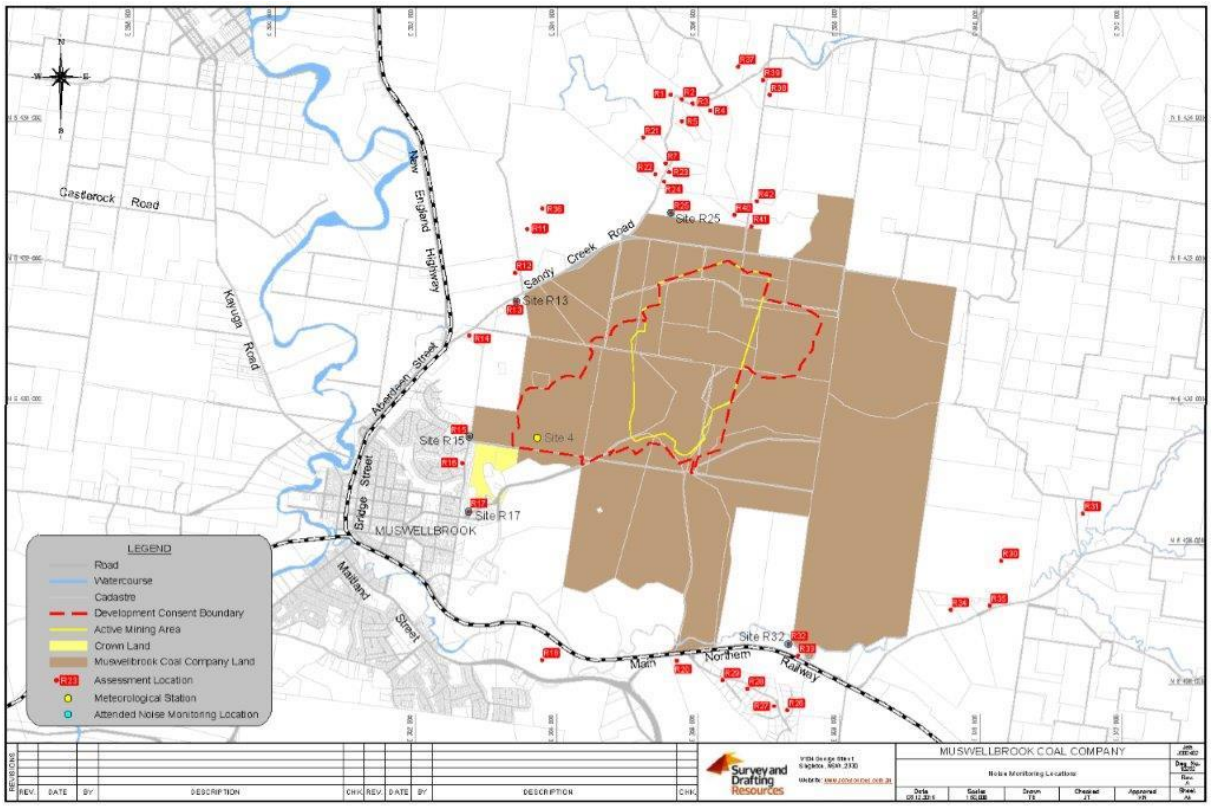

Figure 1 – Noise Monitoring Locations

Noise criteria for all assessment locations shown in Figure 1 are detailed in **Appendix I** to this report.

Monitoring Equipment

Attended noise monitoring was conducted with a Brüel & Kjær Type 2250 Precision Sound Analyser. This instrument has Type 1 characteristics as defined in AS1259-1990 “Sound Level Meters” and has current NATA calibration. Field calibration is carried out at the start and end of each monitoring period. Calibration certificates are attached as **Appendix II** to this report.

A-weighted noise levels were measured over the 15 minute monitoring period with data acquired of 1 second statistical intervals and the meter set to “fast” response. Each 1 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing NPI ‘modifying factors’.

Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The MCC compliance noise criteria are based on a 15 minute Leq noise level. The 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from MCC was audible Bruel & Kjaer "*Evaluator*" analysis software was used to quantify the contribution of the mine and other significant noise sources to the overall level. Mine noise from MCC is shown in the table in bold type.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise detailed.

MCC Operations

Operational details for MCC for the monitoring period on the 28th of February, 2024 are detailed in **Appendix III**. At the time of the noise monitoring MCC had ceased mining operations and work was being undertaken to rehabilitate the site.

Noise Compliance Assessment

The results of the noise measurements are shown in **Table 2**.

Table 2
MCC Operational Noise Monitoring Results – 28 February 2024

Location	Time	dB(A), Leq	MCC Contribution dB(A), Leq	Criterion dB(A) Leq	dB(A), L1 (1min)[1]	Criterion dB(A), L1 (1min)[1]	Stability Class/ Wind speed (m/s)/dir^{o}	Compliant Met Conditions?	Identified Noise Sources[2]
R13 Sandy Creek Rd.	12:43am	35	33	41	35	45	D/3.8.140	No	**MCC (33)**, insects (31)
R15 Queen St.	1:12am	38	n/a	37	n/a	45	D/3.6/143	No	Insects (36), dog (33), frogs (28), **MCC inaudible**
R17 Queen St.	1:36am	44	n/a	35	n/a	45	D/3.5/162	No	Insects (44), traffic (32), **MCC inaudible**
R25 Sandy Creek Rd.	12:20am	43	31	42	34	45	D/4.6/140	No	Insects (42), **MCC (31)**, dogs (30)
R32 Muscle Creek Rd.	2:07am	36	n/a	35	n/a	45	D/2.2/122	Yes	Insects (34), birds (29), traffic (29), **MCC inaudible**

1. L1 (1 min) from MCC mine noise only
2. See text regarding MCC noise sources

The results in Table 2 show that, under the operational and meteorological conditions at the time, noise from MCC was inaudible at monitoring locations R15, R17, R32.

Table 2 also shows that the noise was consistent enough to be measurable at monitoring locations R13, and R25. At these locations the noise from MCC was from a combination of mine hum with occasional engine revs, and dozer tracks.

The data analysis presented in Table 2 shows that the noise from MCC did not exceed the relevant noise criteria at any time or location during the monitoring period.

The data from the mine operated weather station showed that meteorological conditions were not compliant with the conditions in the NMP for the entire noise monitoring survey, except for at location R32.

As indicated above, noise from MCC was measurable at monitoring locations R13, and R25.

Data from those times where MCC operations were audible during the monitoring survey were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal or impulsive components as per definitions in the NPI.

The methodology for analysing the low frequency noise modifying factor correction in the NPI is shown in extract below.

Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10– 160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A- weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

Table C2 : One-third octave low-frequency noise thresholds.

Hz/dB(Z)	**One-third octave dB(Z) Leq (15 min) threshold level**												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The correction applies to the mine noise component only. There are many sources of low frequency noise in the acoustic environment of each receiver area (including noise from road and rail traffic). In many cases the C minus A level is greater than 15 due to these other noise sources. In most instances the screening criteria will be the one third octave analysis. The NPI quantitative assessment of noise from MCC can only be conducted where the noise was clearly definable, which is at a level typically greater than 30 dB(A) or when there are no other significant sources.

Table 3 presents the low-frequency assessment of the mine noise measured at 31 dB(A) at Location R25 on the 28th February 2024.

Table 3. Low-frequency analysis – R25 Sandy Creek Rd 12:20 am													
Hz/dB(Z)	**One-third octave $L_{Zeq,15min}$ threshold level**												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R25, dB(Z)	--	41	58	47	47	44	40	40	36	38	39	35	29
Threshold, dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44
Exceedance, dB	--	0	0	0	0	0	0	0	0	0	0	0	0

Table 4 presents the low-frequency assessment of the mine noise measured at 33 dB(A) at Location R13 on the 28th February 2024.

Table 4. Low-frequency analysis – R13 Sandy Creek Rd 12:43 am													
Hz/dB(Z)	**One-third octave $L_{Zeq,15min}$ threshold level**												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R13, dB(Z)	--	55	50	49	44	42	43	40	40	40	39	34	35
Threshold, dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44
Exceedance, dB	--	0	0	0	0	0	0	0	0	0	0	0	0

The results in Tables 3 to 4 show no exceedance of the low-frequency criteria.

In addition to the operational noise, the noise from MCC must not exceed **45 or 47 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am (see Appendix I for details of noise criteria at various receiver locations). This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine.

The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the facade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring

location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations.

It must be noted, however, that the sleep disturbance criterion is applicable at the outside of a bedroom window. As the internal layout of each residence is not known, to consider a worst case, the bedroom windows were assumed to be facing towards the mine.

As shown in Table 2, during the night time measurement circuit the L1 (1 min) noise from MCC did not exceed 45 dB(A) at any monitoring location.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on (02) 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington
Acoustical Consultant

Appendix I

Noise criteria from Development Consent DA205/2002 (Locations as per Figure 1).

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1\ (1\ minute)}$
R1, R2, R3, R4, R17, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R37, R38, R39	35	35	35	45
R5	36	36	36	45
R7	38	38	38	45
R11	39	39	39	45
R12	39	39	39	45
R13	41	41	41	45
R14	38	38	38	45
R15	37	37	37	45
R16	36	36	36	45
R17	35	35	35	45
R18	45	38	37	47
R20	45	38	37	47
R21	37	37	37	45
R22	39	39	39	45
R23	39	39	39	45
R24	40	40	40	45
R25	42	42	42	45
R36	38	38	38	45
R40	42	42	42	45
R41	42	42	42	45
R42	40	40	40	45

Note: All levels are in dB(A)
Note: Following further consultation with the community it has been identified that R11 is a stable complex, not a residence, so the criteria listed in the table above do not apply.

Appendix II

Calibration Certificates

NVMS

Australian Calibration Laboratory
Suite 4.03, Level 4, 3 Thomas Holt Drive, Macquarie Park NSW 2113, Australia
Accredited for compliance with ISO/IEC 17025 - Calibration. Laboratory No. 1301

NATA
WORLD RECOGNISED ACCREDITATION

CERTIFICATE OF CALIBRATION

Certificate No: CAU2300638

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CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	No: 2653961
Microphone:	Brüel & Kjær	4966	No: 3343809
Preamplifier:	Brüel & Kjær	ZC-0032	No: 25104
Supplied Calibrator:	None		
Software version:	BZ7224 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1897-11	Identification:	N/A

CUSTOMER:

Spectrum Acoustics Pty Ltd
8 Panylan St
Cardiff NSW 2285

CALIBRATION CONDITIONS:

Preconditioning:	4 hours at 23 °C
Environment conditions:	*see actual values in **Environmental conditions** sections*

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1.
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
The measurements included in this document are traceable to Australian/National standards.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 8.6 - DB: 8.60) and test procedure 2250-4966.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
	Calibration without repair/adjustment	X	Calibration after repair/adjustment

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration: 12/09/2023

Certificate issued: 12/09/2023

Sajeeb Tharayil
Calibration Technician

Craig Patrick
Approved signatory

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C21052

Client Details Spectrum Acoustics
30 Veronica Street
Cardiff NSW 2285

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 75503

Atmospheric Conditions
Ambient Temperature : 23.8°C
Relative Humidity : 48.3%
Barometric Pressure : 100.16kPa

Calibration Technician : Jeff Yu
Calibration Date : 04 Feb 2021
Secondary Check: Max Moore
Report Issue Date : 5 Feb 2021

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.00	1000.30

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.14dB*	*Temperature*	*±0.2°C*
Frequency	*±0.09%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.09%*	*Barometric Pressure*	*±0.015kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Appendix III

Operational Details – 28 February 2024 (12:00am to 2:30am)

Excavator and Truck

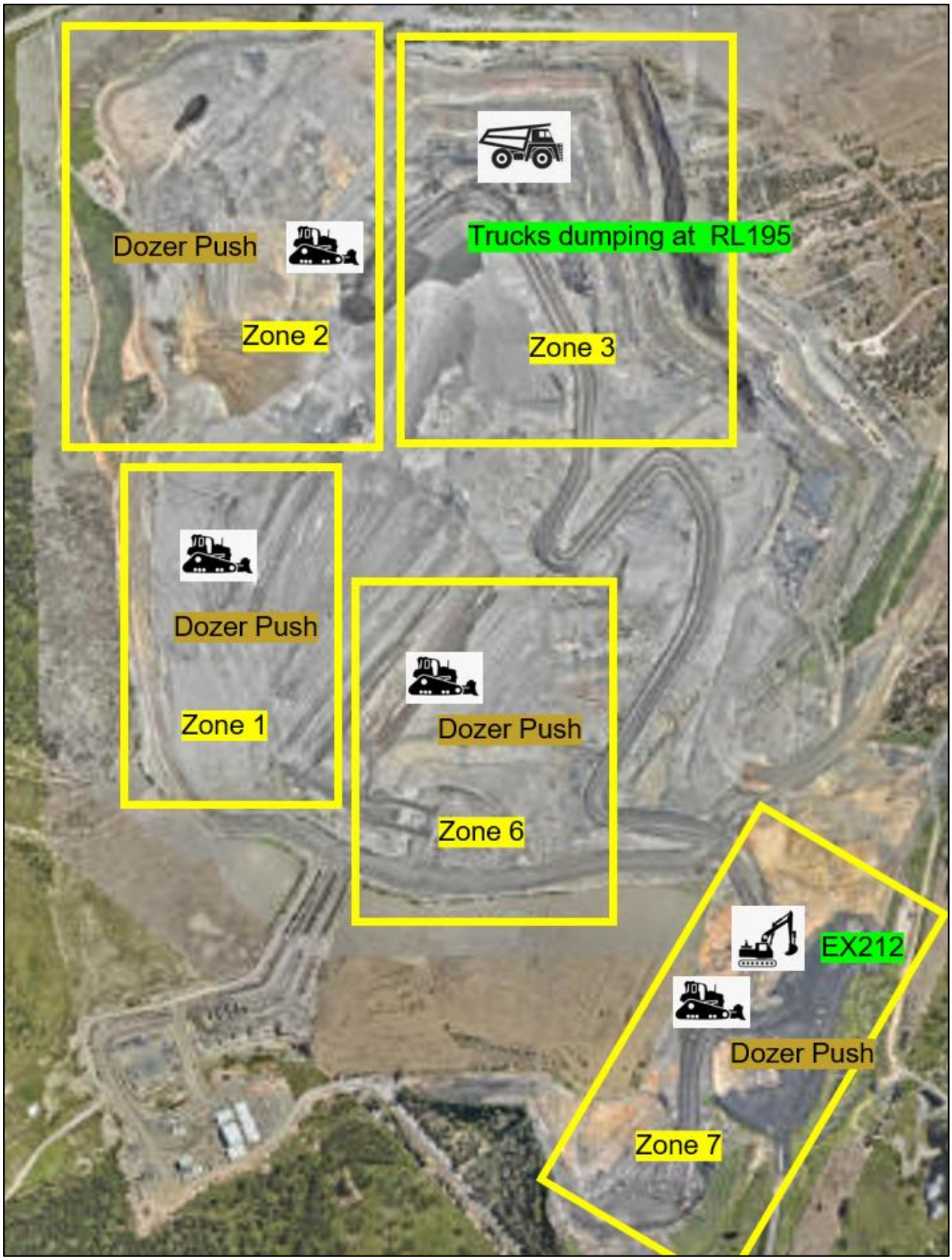
- EX212 was operating in the CHPP (Zone 7) with 3 x 777 trucks running to the RL195 dump area (Zone 3).

Dozer Push

- 2x DZ's were being used in Zone 1 on waste
- 2x DZ's were being used in Zone 2 on waste
- 3x DZ's were being used in Zone 6 on waste
- 1x DZ was being used at RL195 dump area on carb material push/ dump maintenance
- 1x DZ was being used in Zone 7 on carb material push

Ancillary Equipment

- 1x Grader being used for haul road maintenance


Dozer Push
Zone 2
Trucks dumping at RL195
Zone 3
Dozer Push
Zone 1
Dozer Push
Zone 6
EX212
Dozer Push
Zone 7